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UTILITY
PATENT APPLICATION
TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No. 003239.P080
First Inventor or Application Identifier Manjiri S. Gadagkar
Title A NETWORKING DEVICE AND METHOD FOR PROVIDING A
Express Mail Label No. EL466331587US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO:

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1. ☒ Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)
2. ☒ Specification [Total Pages 17]
(preferred arrangement set forth below)
 - Descriptive title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 5]
4. Oath or Declaration [Total Pages 5]
 - a. ☒ Newly executed (original copy)
 - b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
 - i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR §§ 1.63(d)(2) and 1.33(b).

5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
 - a. ☐ Computer Readable Copy
 - b. ☐ Paper Copy (identical to computer copy)
 - c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement ☐ Power of Attorney
(when there is an assignee)
9. ☐ English Translation Document (if applicable)
10. ☐ Information Disclosure Statement (IDS)/PTO - 1449 ☐ Copies of IDS Citations
11. ☐ Preliminary Amendment
12. ☐ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. ☐ *Small Entity ☐ Statement filed in prior application,
Statement(s) Status still proper and desired
14. ☐ Certified Copy of Priority Document(s)
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15. ☐ Other: _____

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16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No:

Prior application Information: Examiner _____ Group/Art Unit: _____

For CONTINUATION or DIVISIONAL APPS only. The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

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Signature _____ Date 09/19/00

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See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT (\$) 1,026.00

Complete if Known

Application Number	
Filing Date	September 19, 2000
First Named Inventor	Manjiri S. Gadagkar
Examiner Name	
Group/Art Unit	
Attorney Docket No.	003239.P080

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees to
- ☒ The Commissioner is hereby authorized to credit any over payments to

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

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2. ☒ Payment Enclosed:
- ☒ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Code	Fee (\$)	Code	Fee (\$)		
101	690	201	345	Utility filing fee	\$690.00
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	690	208	345	Reissue filing fee	
114	150	214	75	Provisional filing fee	
SUBTOTAL (1)					(\$) 690.00

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
25	20 = 5	18.00	\$90.00
4	3 = 1	78.00	\$78.00
Multiple Dependent			

**or number previously paid, if greater, For Reissues, see below

Large Entity		Small Entity		Fee Description	Fee Paid
Code	Fee (\$)	Code	Fee (\$)		
103	18	203	9	Claims in excess of 20	
102	78	202	39	Independent claims in excess of 3	
104	260	204	130	Multiple Dependent claim, if not paid	
109	78	209	39	**Reissue independent claims over original patent	
110	18	210	9	**Reissue claims in excess of 20 and over original patent	
SUBTOTAL (2)					(\$) 168.00

FEE CALCULATION (continued)

3. ADDITIONAL FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Code	Fee (\$)	Code	Fee (\$)		
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for response within first month	
116	380	216	190	Extension for response within second month	
117	870	217	435	Extension for response within third month	
118	1,210	218	680	Extension for response within fourth month	
128	1,850	228	925	Extension for response within fifth month	
119	300	219	150	Notice of Appeal	
120	300	220	150	Filing a brief in support of an appeal	
121	260	221	130	Request for oral hearing	
138	1,510	138	1510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,210	241	605	Petition to revive - unintentional	
142	1,210	242	605	Utility issue fee (or reissue)	
143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40.00
146	790	246	395	Filing a submission after final rejection (37 CFR 1.129(a))	
149	790	249	395	For each additional invention to be examined (37 CFR 1.129(b))	
Other fee (specify)					
Other fee (specify)					
* Reduced by Basic Filing Fee Paid					
SUBTOTAL (3)					(\$) 168.00

SUBMITTED BY

Typed or Printed Name	William W. Schaal		Complete (if applicable)	
Signature	Date	09/19/00	Reg. Number	39,018
			Deposit Account User ID	02-2666

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BSTZ No. 003239.P080
Express Mail No. EL466331587US

UNITED STATES PATENT APPLICATION

FOR

**A NETWORKING DEVICE AND METHOD FOR PROVIDING A
PREDICTABLE MEMBERSHIP SCHEME FOR POLICY-BASED VLANS**

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A NETWORKING DEVICE AND METHOD FOR PROVIDING A PREDICTABLE MEMBERSHIP SCHEME FOR POLICY-BASED VLANS

1. Field of the Invention

5 The present invention relates to the field of data communications. More specifically, the present invention relates to a networking device and method for providing a predictable membership scheme for policy-based virtual local area networks (VLANs).

2. General Background

10 The ability of users to access programs and to share data over a local area network (referred to as "LAN") has become a necessity for most working environments. Frequently, as the amount of data traffic over the LAN increases, efforts have been made reduce data traffic congestion. One technique involves
15 separating the LAN into multiple LAN segments, using a networking device such as a bridge or network switch operating at a Media Access Control (MAC) sublayer of the Data Link layer (layer 2) of the International Standards Organization (ISO) Open Systems Interconnection (OSI) reference model. For
20 this implementation, however, all networking devices connected to the LAN still belong to the same broadcast domain.

 As the number of LAN segments and networking devices per segment increase, in many cases, the networking devices become overburdened processing broadcast data frames. Thus, under such circumstances, it is desirable to separate
25 the growing data network into multiple broadcast domains. One possible approach for providing multiple broadcast domains is to configure the LAN with multiple virtual local area networks (VLANs).

 In general, a "VLAN" is a logical local area network that can roughly be equated to a broadcast domain. A VLAN may comprise a plurality of networking
30 devices, perhaps on multiple LAN segments, that are not constrained by their

physical location. A network administrator determines the configuration of the VLAN based on a selected VLAN membership mechanism.

For example, the most common VLAN membership mechanism is to classify selected groups of ports for a networking device as VLANs. For example, a first group of ports may form one VLAN while a second group of ports may form another VLAN. This port-based VLAN membership mechanism has a number of disadvantages. In particular, it does not allow for multiple VLANs to share the same networking device port. Also, it requires the network administrator to reconfigure VLAN membership each time a networking device moves from one port to another.

An alternative solution is to utilize policy-based VLANs in which one or more ports are classified as a member of a VLAN if the contents of their incoming frames satisfy the policy associated with the VLAN. For example, if the “policy” for the VLAN is “protocol-based,” those ports of the networking device that receive frames having a certain protocol are members of the VLAN. Besides protocol-based, examples of other types of “policy” include grouping based on source MAC address, source IP subnet and the like.

One problem associated with policy-based VLANs is that each and every port of a networking device may not be able to classify untagged frames based on the policy in question. For example, the networking device may include different application specific integrated circuits (ASICs) responsible for different ports. Both of these ASICs may support different VLAN capabilities. For example, one ASIC may support policy-based VLANs and the other ASIC may not. Thus, this may result in non-uniform classification of frames depending upon the port on which they are received.

SUMMARY

The invention relates to a networking device and method for providing a predictable membership scheme for policy-based virtual local area networks (VLANs). In the event that identical behavior toward expected and unexpected untagged frames is desired, a first membership scheme imposes a first set of rules for allowing or denying membership, changing the tagging option of a port, and changing the filtering option of the port. However, in the event that different behavior toward expected and unexpected untagged frames is desired, a second membership scheme may be utilized. This scheme imposes a second set of rules for allowing or denying membership and changing the tagging option of a port. These schemes provide greater accuracy in formulating VLANs than traditional techniques because it accounts for the classification for all types of frames, both untagged and tagged frames, as well as various tagging and filtering option changes.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying claims and figures.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the present invention will become apparent from the following detailed description of the present invention in which:

Figure 1 is an exemplary embodiment of a network employing a plurality of virtual local area networks (VLANs).

Figure 2 is an exemplary embodiment of a networking device employed in the network of Figure 1.

Figure 3 is a first exemplary embodiment of a flowchart describing a method for allowing or denying membership to a policy-based VLAN in a predictable manner to ensure identical behavior toward expected and unexpected untagged frames.

Figures 4 is a first exemplary embodiment of a flowchart describing a method for allowing or denying a change in the tagging option of a port to ensure identical behavior toward expected and unexpected untagged frames.

Figures 5 is a first exemplary embodiment of a flowchart describing a method for allowing or denying a change in the filtering option of a port to ensure identical behavior toward expected and unexpected untagged frames.

Figures 6 is a second exemplary embodiment of a flowchart describing a method for allowing or denying membership to a policy-based VLAN in a predictable manner to ensure different behavior toward expected and unexpected untagged frames.

Figures 7 is a second exemplary embodiment of a flowchart describing a method for allowing or denying a change in the tagging option of a port to ensure different behavior toward expected and unexpected untagged frames.

DETAILED DESCRIPTION OF THE INVENTION

Herein, the exemplary embodiments of the present invention relate to a networking device and method for providing a predictable membership scheme for policy-based virtual local area networks (VLANs). These embodiments are not exclusive; rather, they merely provide a thorough understanding of the present invention. Well-known circuits are not set forth in detail in order to avoid unnecessarily obscuring the present invention.

In the following description, certain terminology is used to describe features of the present invention. For example, a "link" is broadly defined as one or more information-carrying mediums to establish a communication pathway. Examples of the medium include a physical medium (e.g., electrical wire, optical fiber, cable, bus traces, etc.) or a wireless medium (e.g., air in combination with wireless signaling technology). "Logic" includes hardware and/or software that perform a certain function on incoming information. The software may include a program featuring a collection of subprograms being executable code. Examples of a program include an operating system, an application or even an applet for example.

The term “information” is defined as data, address, and/or control.

Information may be transferred over the link using at least two different types of frames, namely “tagged” or “untagged”. In accordance with an Institute of Electrical and Electronics Engineers (IEEE) draft standard entitled “Draft

5 Standard 802.1Q/D9 IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks,” published February 20, 1998, a “tagged frame” is a sequence of bytes including a fixed-length field (referred to as a “tag header”) that immediately provides the networking device with its VLAN identification information. The VLAN identification information identifies which
10 particular VLAN the data within the frame will be routed. The “untagged frame” is a sequence of bytes that does not contain the tag header.

Referring to Figure 1, a first exemplary embodiment of a network 100 in accordance with the invention is illustrated. The network 100 comprises one or more (N) networking device 110₁-110_N that communicate with each other via
15 links 120₁-120_M (where $M \geq N$). Each “networking device” comprising processing logic (e.g., a processor, microcontroller, state machine, etc.) and a transceiver for receiving/transmitting information from/to another networking device. Examples of a networking device include a computer (e.g., server, mainframe, workstation, desktop, laptop, hand-held, etc.), communications
20 equipment (e.g., a bridge, router, switch, etc.) and the like.

For this embodiment, one networking device 110₁ featuring a first plurality of ingress ports 120 and a second plurality of egress ports 130 that output information to another networking device 110₂. The ingress ports 120 can be members of one or more virtual local area networks (VLANs) such as VLANs 140
25 and 141, where VLAN 140 is based on a first policy and VLAN 141 is based on a different policy. Policies may include any guidelines or parameters to prioritize various types of data traffic (e.g., real-time video, e-mails, etc.). For example, VLAN 141 may include an Internet-Protocol (IP) based VLAN where all incoming IP frames are classified into VLAN 141.

30 Referring now to Figure 2, an exemplary embodiment of the networking device 110₁ is shown. Networking device 110₁ comprises ingress ports 120 and

egress ports 130. The ingress ports 120 receive frames from a source such as another networking device. These frames may be tagged or untagged in accordance with the IEEE 802.1Q/D9 standard. As an illustrative example, a first ingress port 121 expects tagged frames only (e.g., ports 121 is a tag-only port) while a group 125 of ingress ports (e.g., ports 122-124) expect untagged frames. Moreover, for illustrative purposes, port 122 supports the first policy toward untagged frames but does not support the second policy toward untagged frames. Ports 123 supports the second policy, while port 124 supports both the first and second policies.

10 The networking device 110₁ further comprises a processing logic 200 and a memory 210. The memory 210 may include non-volatile memory to contain software that controls a membership scheme for policy-based virtual local area networks (VLANs). Certain parameters used by the software may be modified from an external source (e.g., another networking device utilized by a network administrator) or may be self-modifiable based on dynamic changes to the network. Of course, in lieu of software, functionality to support the membership scheme may be implemented in hardware or firmware.

Referring now to Figure 3, a first exemplary embodiment of a flowchart describing a method for providing a predictable membership scheme for a policy-based VLAN of Figure 1 is shown. This method is configured to ensure identical behavior toward expected and unexpected untagged frames for example.

Herein, a policy-based VLAN (e.g., VLAN 141) is created and the “policy” is specified (block 300). Since both tagged and untagged frames can pass through any of the ingress ports associated with the networking device of Figure 2, a VLAN membership scheme may be implemented based on one or more of the following factors: (1) the capability of the port to classify untagged frames based on a particular policy; (2) the current “tagging” option of the port; and (3) the current “filtering” option of the port. From this scheme, VLAN membership for each port of the networking device is determined. A port is considered “tag-only” if the current “tagging” option is “tagged” and the current “filtering” option is

“filter untagged frames”. When a port is configured as “tag-only”, it can be said that untagged frames are not expected on that port.

In particular, for this embodiment, a determination is made whether the port supports a particular policy classification (e.g., second policy) for untagged frames (block 310). This determination may be made either by the processing logic internally within the networking device itself or by logic within a device external to the networking device. If the port does not support that policy classification (e.g., ports 121 or 122 of Figure 2), a determination is made whether the port is a “tag-only” port (block 315). If the port is a tag-only port (e.g., port 121 of Figure 2), membership to the policy-based VLAN would be allowed (block 320). The reason for allowance of the membership is due to the fact that no untagged frames are expected to pass through the port. Otherwise, membership to the policy-based VLAN would be denied (block 325).

If the port supports the policy classification (e.g., ports 123 and 124 of Figure 2), a determination is made whether the port is currently a member of another VLAN with the same policy (block 330). If so, membership to the policy-based VLAN would be denied because, while membership to multiple VLANs is permissible, membership to two VLANs based on the same policy is not (block 335). If the port is currently not a member of another VLAN with the same policy, then membership to the policy-based VLAN would be allowed (block 340).

With respect to Figure 4, an exemplary embodiment of a flowchart describing a protocol for changing a “tagging” option of a port in accordance with the membership protocol of Figure 3 is shown. A determination is made whether the change in the “tagging” option of the port is from an “Untagged” state to a “Tagged” state (block 400). Similarly, this determination may be made either by the processing logic internally within the networking device itself or by logic within a device external to the networking device. If the change in the tagging option places the port in a Tagged state, this change is allowed because the original Untagged state would not have allowed membership that poses restrictions on the change in question (block 410).

However, in certain situations as noted above, VLAN membership may be granted in light of the unexpected nature of untagged frames of a “tag-only” port. Thus, a change in a tagging option of the port from a Tagged state to an Untagged state requires a second determination; namely, whether the port is currently a member of any VLAN whose certain policy type for untagged frames is not supported (block 420). If the port is not a member of a VLAN whose policy type is not supported by this port for untagged frames, the change in the tagging option is allowed (block 430). Otherwise, the change in the tagging option is denied because this port is required to remain “tag-only” (block 440).

With respect to Figure 5, an exemplary embodiment of a flowchart describing a protocol for changing a “filtering” option of a port in accordance with the membership protocol of Figure 3 is shown. A determination whether to allow a change in the filtering option is made either by the processing logic internally within the networking device itself or by logic within a device external to the networking device. The change in the filtering option is allowed when occurring from a “Do Not Filter” state to a “Do Filter” state (blocks 500 and 510).

If the filtering option is changed from a “Do Filter” state to a “Do Not Filter” state, a determination is made whether the port is a currently member of any VLAN whose policy for untagged frames is not supported (block 520). If the port is not a member of a VLAN whose policy type for untagged frames is not supported, the change in the filtering option is allowed (block 530). However, if the port is currently a member of a VLAN whose policy type for untagged frames is not supported, the change in the filtering option is denied (block 540).

Referring now to Figure 6, a second exemplary embodiment of a flowchart describing a method for providing a predictable membership scheme for a policy-based VLAN of Figure 1 is shown. This method is configured to allow membership into multiple policy-based VLANs when untagged frames are not expected. This method employs different behavior toward expected and unexpected untagged frames. In this method, untagged frames are considered to be unexpected if the tagging option is “tagged”. Herein, a policy-based VLAN is created and the “policy” is specified (block 600). Since both tagged and untagged

frames can pass through the ingress ports associated with a VLAN, a mechanism may be implemented based on a port's capability to classify untagged frames based on the policy and its current "tagging" option.

In particular, for this embodiment, a determination is made whether the port is currently in a Tagged state (block 610). If so, membership to the VLAN is allowed and untagged frames will be classified based on a Port VLAN Identification (PVID) for this port (block 615). If the port currently in an Untagged state, a subsequent determination is made whether the port supports the policy-based classification of this VLAN (block 620). If the port does not support the policy-based classification of the VLAN, membership to the VLAN is denied (block 625). Otherwise, yet another subsequent determination is whether the port already is a member of another VLAN with the same policy (block 630). If so, membership to the VLAN is denied (block 635). If the port is not a member of another VLAN with the same policy, membership to the VLAN is allowed (block 640).

With respect to Figure 7, an exemplary embodiment of a flowchart describing a protocol for changing a "tagging" option of a port in accordance with the membership protocol of Figure 6 is shown. First, a determination is made whether the change in the tagging option is from an Untagged port to a Tagged port (block 700). If so, the change in the tagging option is allowed because the original Untagged state would not have allowed membership that poses restrictions on the change in question and all untagged frames will now be classified based on PVID (block 710). If not, a determination is made whether the port is a member of a VLAN whose policy type for untagged frames is not supported (block 720). If the port is a member of a VLAN whose policy type for untagged frames is not supported, the change in the tagging option is denied (block 730). If the port is not a member of a VLAN whose policy type for untagged frames is not supported, a determination is made whether the port already belongs to a VLAN having the same policy (block 740). If so, the change in the tagging option is denied (block 750). If not, the change in the tagging

option is allowed so that untagged frames will now be considered for classification based on policy (block 760).

While certain exemplary embodiments have been described and shown in the accompanying drawings, it is to be understood that such embodiments are merely illustrative of and not restrictive on the broad invention, and that this
5 invention not be limited to the specific constructions and arrangements shown and described, since various other modifications may occur to those ordinarily skilled in the art.

CLAIMS

What is claimed is:

- 1 1. A method comprising:
2 determining whether a predetermined policy followed by a first virtual
3 local area network (VLAN) is supported by a port of a networking device;
4 disallowing the port membership to the first VLAN if the port fails to support
5 the predetermined policy; and
6 allowing the port membership to the first VLAN if the port fails to support the
7 predetermined policy and the port constitutes a tag-only port.
- 1 2. The method of claim 1 further comprising:
2 disallowing the port membership to the first VLAN if the port supports the
3 predetermined policy and is a current member of a second VLAN following the
4 predetermined policy.
- 1 3. The method of claim 2 further comprising:
2 allowing the port membership to the first VLAN if the port supports the
3 predetermined policy and is not a current member of a second VLAN following the
4 predetermined policy.
- 1 4. The method of claim 1, wherein the predetermined policy is associated
2 with untagged frames.
- 1 5. The method of claim 1 further comprising:
2 determining whether a change of a tagging option of the port is requested; and
3 allowing the change in the tagging option from an untagged state to a tagged
4 state.

1 6. The method of claim 5 further comprising:
2 disallowing the change in the tagging option if the change in the tagging
3 option is from the tagged state to the untagged state and the port is a member of a
4 second VLAN following the predetermined policy.

1 7. The method of claim 6 further comprising:
2 allowing the change in the tagging option if the change in the tagging option is
3 from the tagged state to the untagged state and the port is not a member of the second
4 VLAN following the predetermined policy.

1 8. The method of claim 1 further comprising:
2 determining whether a change of a filtering option of the port is requested; and
3 allowing the change in the filtering option from a "Do Not Filter" state to a
4 "Do Filter" state.

1 9. The method of claim 8 further comprising:
2 disallowing the change in the filtering option if the change in the filtering
3 option is from the "Do Filter" state to the "Do Not Filter" state and the port is a
4 member of a second VLAN following the predetermined policy.

1 10. The method of claim 9 further comprising:
2 allowing the change in the filtering option if the change in the filtering option
3 is from the "Do Filter" state to the "Do Not Filter" state and the port is not a member
4 of the second VLAN following the predetermined policy.

1 11. A method comprising:
2 determining whether a selected port is a tag-only port;
3 allowing membership of the port to a first virtual local area network
4 (VLAN) if the selected port is a tag-only port;

5 determining whether a predetermined policy followed by the first VLAN is
6 supported by a port of a networking device;
7 disallowing the port membership to the first VLAN if the port fails to support
8 the predetermined policy and the selected port is a member of a second VLAN
9 following the predetermined policy; and
10 allowing the port membership to the first VLAN if the port supports the
11 predetermined policy and the selected port is not a member of the second VLAN
12 following the predetermined policy.

1 12. The method of claim 11 further comprising:
2 disallowing the port membership to the first VLAN if the port supports the
3 predetermined policy and the selected port is a member of the second VLAN
4 following the predetermined policy.

1 13. The method of claim 11, wherein the predetermined policy is
2 associated with untagged frames.

1 14. The method of claim 11 further comprising:
2 determining whether a change of a tagging option of the port is requested; and
3 allowing the change in the tagging option from an untagged state to a tagged
4 state.

1 15. The method of claim 14 further comprising:
2 disallowing the change in the tagging option if the change in the tagging
3 option is from the tagged state to the untagged state and the port is a member of a
4 second VLAN following the predetermined policy.

1 16. The method of claim 14 further comprising:
2 disallowing the change in the tagging option if the change in the tagging
3 option is from the tagged state to the untagged state and the port is a member of the
4 second VLAN following the predetermined policy.

1 17. The method of claim 14 further comprising:
2 disallowing the change in the tagging option if the change in the tagging option is
3 from the tagged state to the untagged state and the port is a member of the second
4 VLAN following the predetermined policy.

1 18. The method of claim 8 further comprising:
2 disallowing the change in the filtering option if (i) the change in the filtering
3 option is from the "Do Filter" state to the "Do Not Filter" state, (ii) the port is a
4 member of a VLAN having a policy that fails to support untagged frames, and (iii) the
5 port is a member of a second VLAN following the predetermined policy.

1 19. A networking device comprising:
2 a plurality of ports; and
3 a processing unit to control membership of at least one of the plurality of
4 ports to a policy-based virtual local area network (VLAN), the processing unit to
5 determine whether a predetermined policy followed by the policy-based VLAN is
6 supported by the at least one of the plurality of ports, and to allow the at least one
7 port of the plurality of ports membership to the policy-based VLAN if the at least
8 one port fails to support the predetermined policy and constitutes a tag-only port.

1 20. The networking device of claim 19, wherein the processing unit
2 further disallows the at least one port of the plurality of ports membership to the
3 policy-based VLAN if the at least one port fails to support the predetermined
4 policy.

1 21. The networking device of claim 20, wherein the processing unit further
2 disallows membership to the policy-based VLAN if the port supports the
3 predetermined policy and is also a current member of another VLAN following the
4 predetermined policy.

1 22. The networking device of claim 21, wherein the predetermined policy
2 is associated with untagged frames.

1 23. The networking device of claim 19, wherein the processing unit further
2 determines whether a change of a tagging option of the at least one port is requested
3 and allows the change in the tagging option if the tagging option is changed from an
4 untagged state to a tagged state.

1 24. The networking device of claim 23, wherein the processing unit further
2 disallows the change in the tagging option if the change in the tagging option is from
3 the tagged state to the untagged state and the at least one port is a member of another
4 VLAN following the predetermined policy.

1 25. A program loaded in memory of a networking device for execution
2 therein, the program comprising:
3 a first subprogram to determine whether a predetermined policy followed
4 by the policy-based VLAN is supported by a port of a networking device;
5 a second subprogram to disallow the at least one port of the plurality of ports
6 membership to the policy-based VLAN if the at least one port fails to support the
7 predetermined policy; and
8 a third subprogram to allow the at least one port of the plurality of ports
9 membership to the policy-based VLAN if the at least one port fails to support the
10 predetermined policy and constitutes a tag-only port.

ABSTRACT

A networking device and method for providing a predictable membership scheme for policy-based virtual local area networks (VLANs). In the event that identical behavior toward incoming expected and unexpected untagged frames is desired, a first membership scheme imposes a first set of rules while a second membership scheme, having a second set of rules, is used if expected and unexpected untagged frames are treated differently.

003239,P080

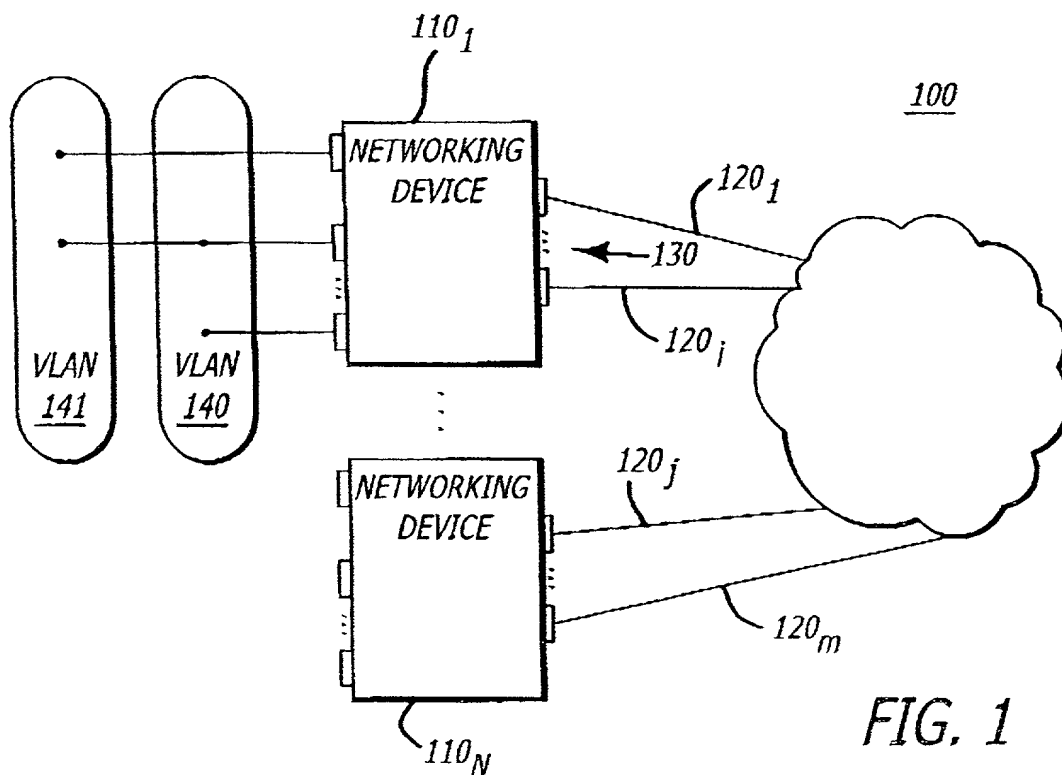


FIG. 1

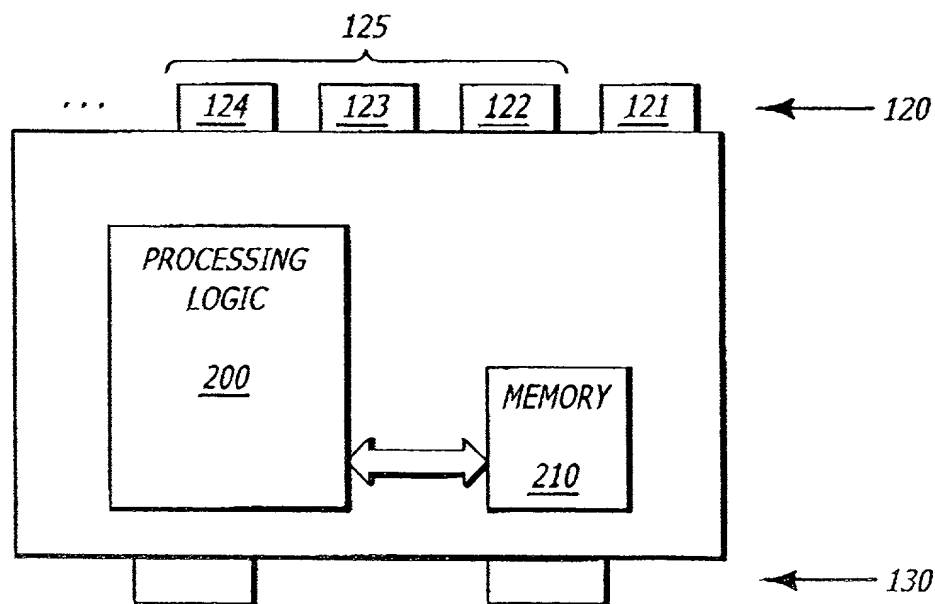


FIG. 2

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FIG. 3

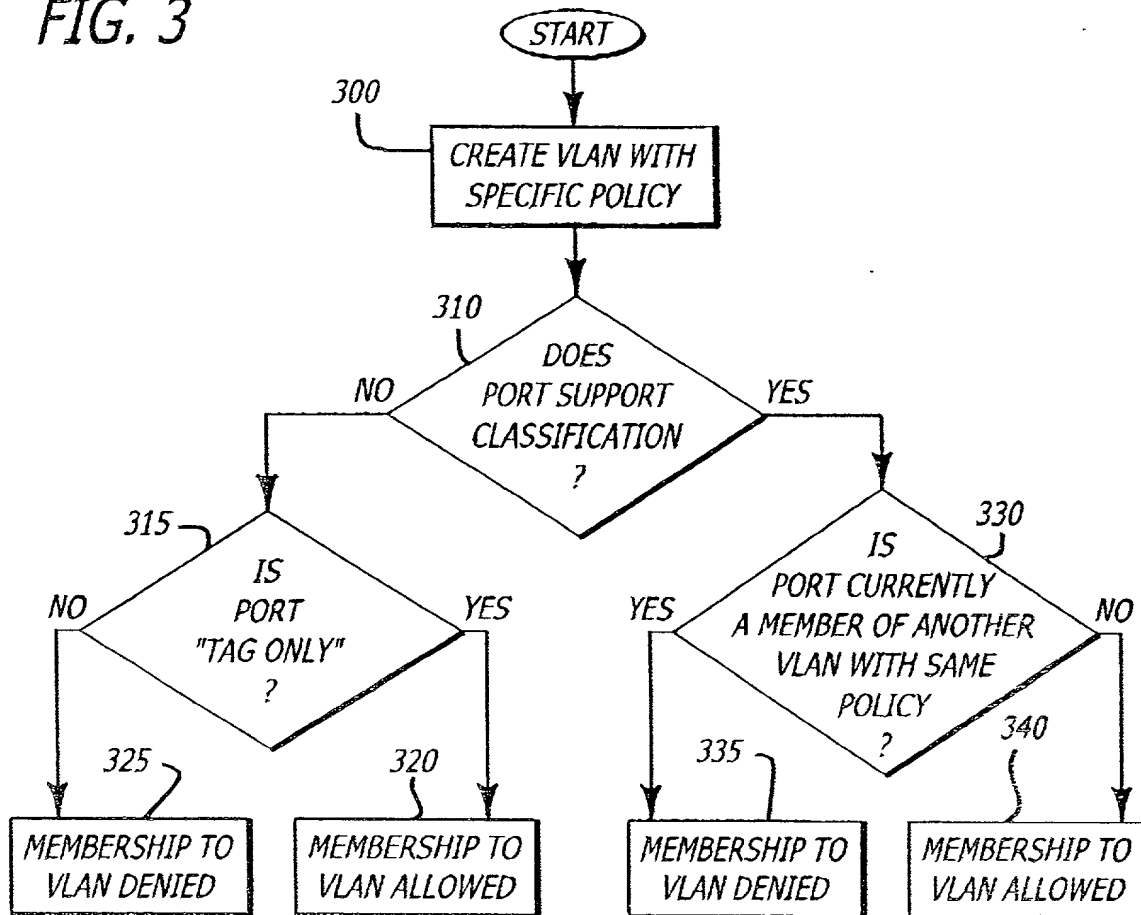
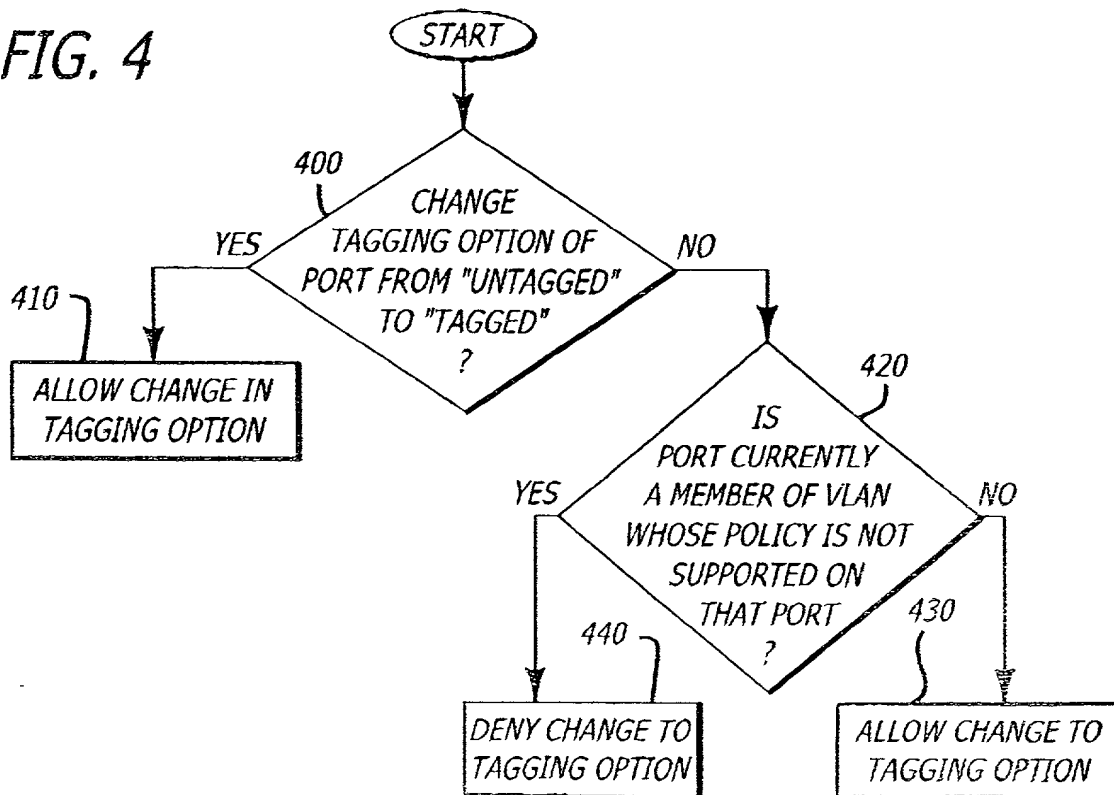


FIG. 4



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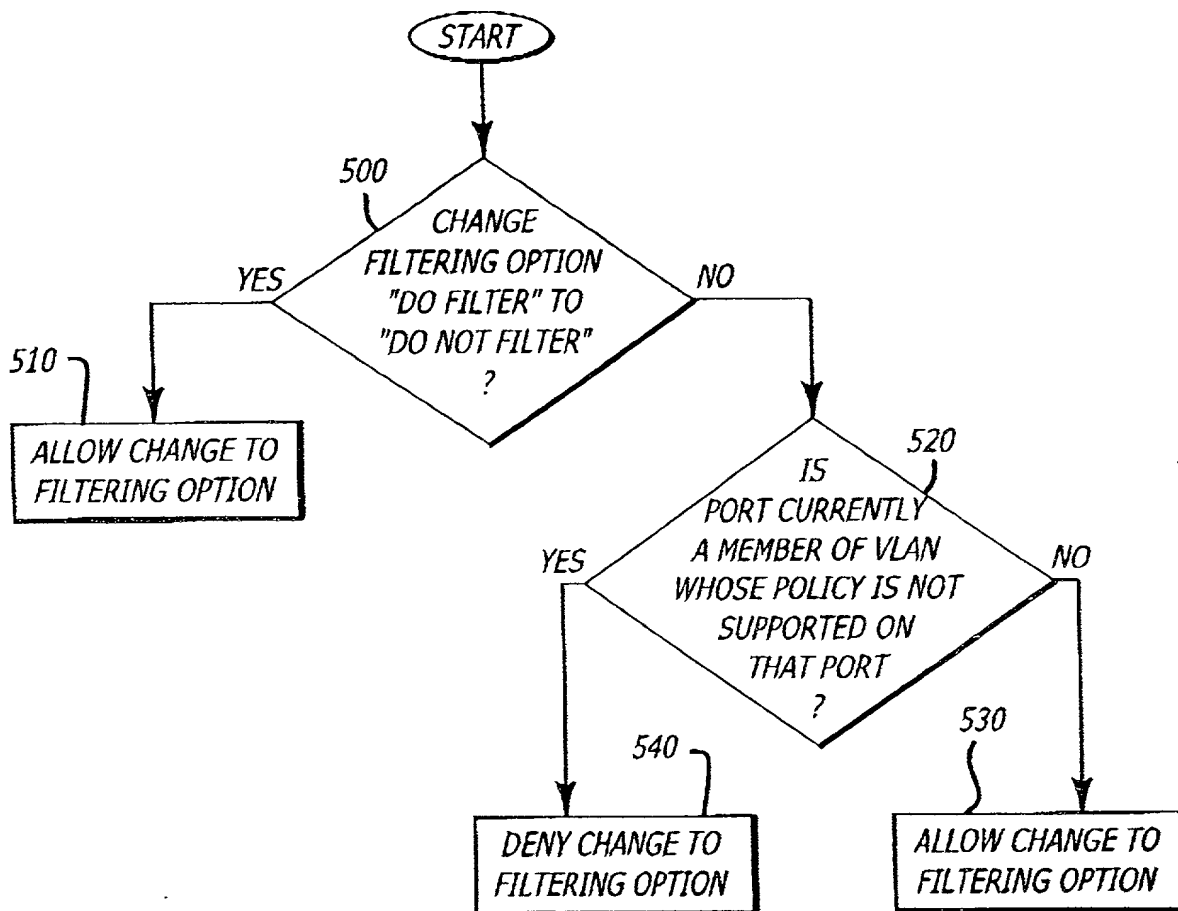


FIG. 5

003239.P080

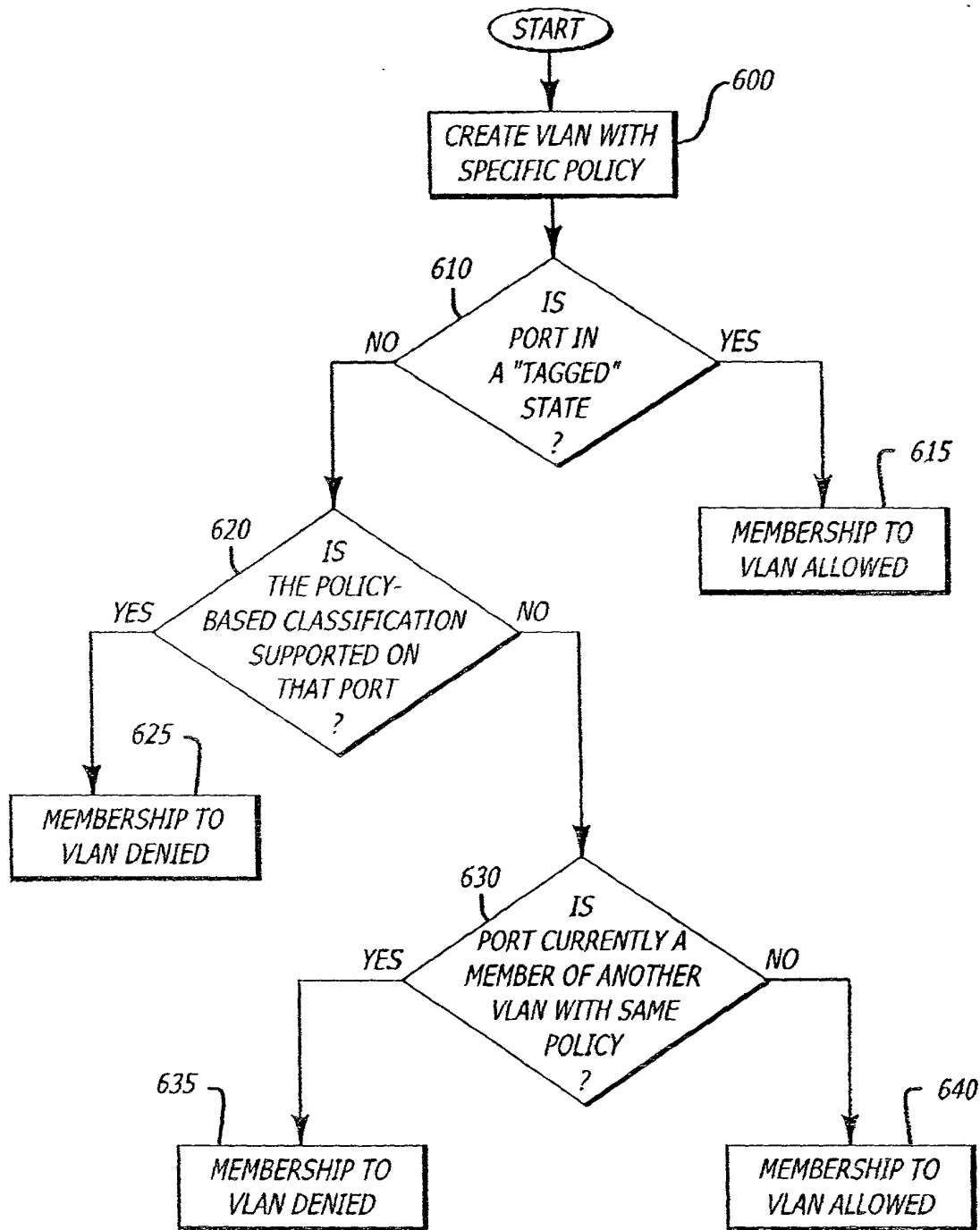


FIG. 6

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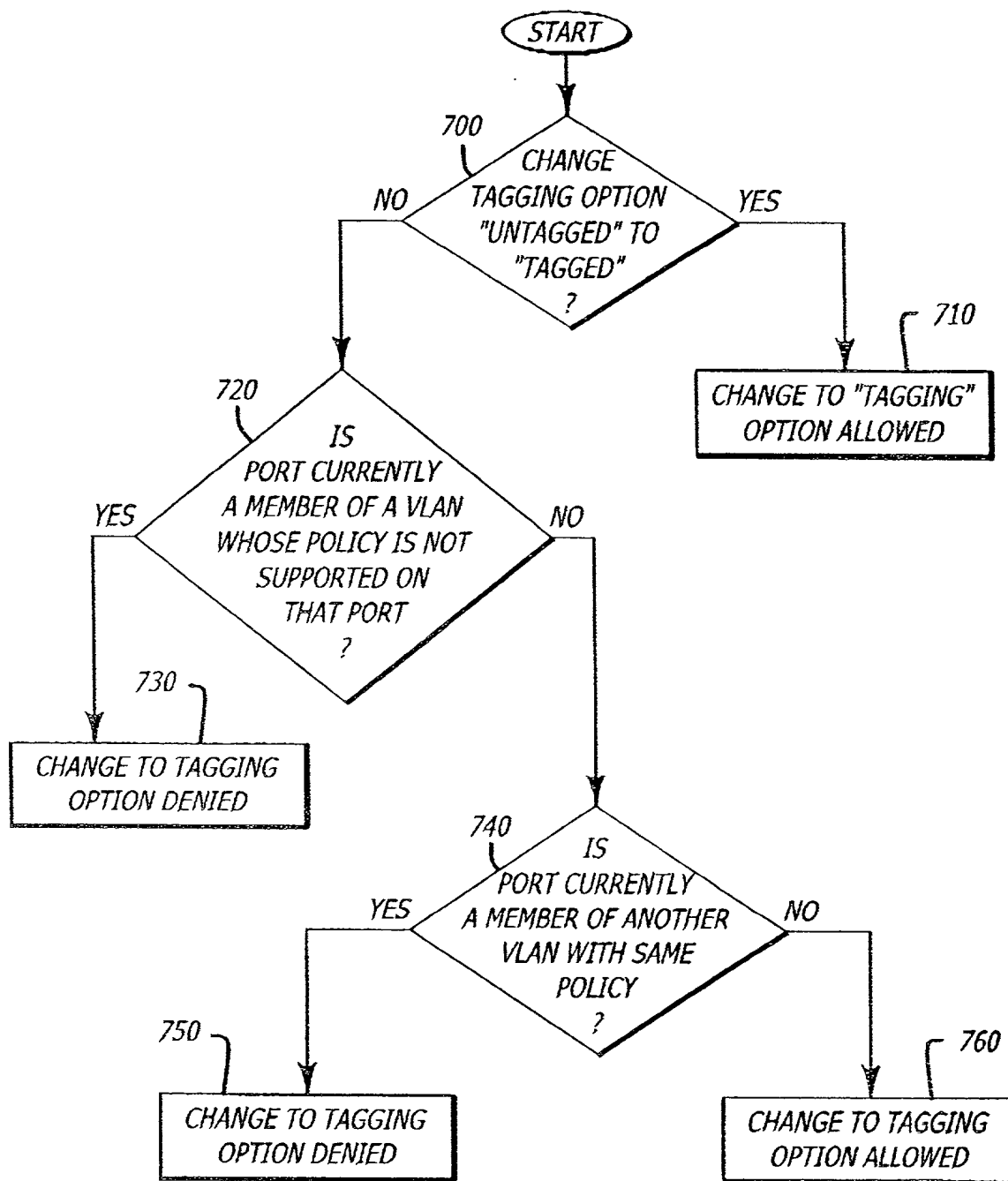


FIG. 7

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

A NETWORKING DEVICE AND METHOD FOR PROVIDING A PREDICTABLE MEMBERSHIP SCHEME FOR POLICY-BASED VLANS

the specification of which

☒ is attached hereto.
☐ was filed on _____ as _____
 United States Application Number _____
 or PCT International Application Number _____
 and was amended on _____
 (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
			<input type="checkbox"/> No <input type="checkbox"/> Yes
			<input type="checkbox"/> No <input type="checkbox"/> Yes
			<input type="checkbox"/> No <input type="checkbox"/> Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

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(Name of Attorney or Agent)

12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025 and direct telephone calls to:

William W. Schaal, (714) 557-3800.

(Name of Attorney or Agent)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature _____

Date _____

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Citizenship _____
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APPENDIX A

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